FAA-E-2456
March 30, 1970

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION SPECIFICATION

DIGITAL AZIMUTH TO SYNCHRO CONVERTER

1. SCOPE

1.1 Scope.- The equipment specified herein is a solid state Digital Azimuth to Synchro Converter. This unit converts a continuous flow of serial pulses, originating at a radar antenna, to two speed synchro signals representing the instantaneous azimuth position of the antenna.

2. APPLICABLE DOCUMENTS

2.1 FAA documents.- The following FAA specifications and standards of the issues specified in the invitation for bids or request for proposals form a part of this specification, and are applicable in their entirety unless otherwise specified herein.

2.1.1 FAA specifications

FAA-E-163	Racks, Cabinet and Open Frame Types
FAA-D-638	Instruction Books, Electronic Equipment
FAA-G-2100/1	Electronic Equipment, General Requirements; Part 1, General Requirements for All Equipments
FAA-G-2100/3	Part 3, Requirements for Equipment Employing Semiconductor Devices
FAA-G-2100/4	Part 4, Requirements for Equipment Employing Printed Wiring Techniques

FAA-G-2100/5 Part 5, Requirements for Equipments Employing Microelectronic Devices

(Copies of these documents, and of the applicable FAA specifications and drawings, may be obtained from Federal Aviation Administration, Washington, D. C. 20590, Attention: Contracting Officer. Requests should fully identify material desired, i.e., specification numbers, dates, amendment numbers, complete drawing numbers; also, requests should state the contract involved or other use to be made of the requested material.)

2.2 Military publications.- The following publications of the issues in effect on the date of the invitation for bids or request for proposals form a part of this specification and applicable to the extent specified herein.

2.2.1 Military standards

MIL-STD-461 Electromagnetic Interference Characteristics Requirements for Equipment

MIL-STD-756A Reliability Prediction

MIL-STD-781B Test Levels and Accept/Reject Criteria for Reliability of Non-Expendable Electronic Equipment

MIL-STD-17555 Electronic and Electrical Equipment and Associated Repair Parts, Preparation for Delivery Of

MIL-STD-470 Maintainability Program Requirements (For System and Equipments)

(Single copies of Military specifications and standards may be requested by mail or telephone from U.S. Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120. For telephone requests call 215-697-3321, 8:00 a.m. to 4:30 p.m. Monday through Friday.)

3. REQUIREMENTS

3.1 General.- The contractor shall provide all necessary services and materials to design, develop, fabricate, test and deliver a Digital Azimuth to Synchro Converter and other equipment as required by this specification in the quantities and at times required by the contract. Any feature or item necessary for proper operation in accordance with the requirements shall be incorporated even though that item or feature may not be specifically described herein. In addition, the contractor shall provide the necessary services to prepare and reproduce the instructional material and other documentation as specified herein.

3.2 Basic design requirements.- The equipment shall be designed so that all alignment adjustments, maintenance, and replacement of parts can be performed by only one technician. The equipment described herein shall be of solid state design and shall have no rotating machinery.

3.3 Definitions

3.3.1 Service conditions.- The service conditions shall be as specified in FAA-G-2100/1, paragraph 1-3.2.23. Ambient conditions shall be those of Environment I (1-3.2.23, FAA-G-2100/1).

3.3.2 Power source.- The converter equipment shall operate from a single phase AC line power source. The design center value (1-3.2.21, FAA-G-2100/1) shall be 120 V, 60 Hz.

3.3.3 Reliability definitions

3.3.3.1 Meantime between failure (MTBF).- Meantime between failure, expressed in hours, is defined as the reciprocal of unit failure rate (λ). (MTBF = $1/\lambda$).

3.3.3.2 Unit failure rate (λ).- Unit failure rate is defined as the sum of the individual part density failure rates within a unit. The individual part density failure rate is the number of parts times the statistical failure rate for that part type.

3.3.3.3 Meantime to repair (MTTR).- Meantime to repair is defined as the meantime to effect repair of the unit and to put the unit in an "up" condition, or if spare modules are provided, the time required to replace a failed module.

3.3.3.4 Failure.- As used herein, failure is defined as any loss of system operational capability, for example, performance outside of specified tolerances which cannot be corrected by maintenance control adjustment.

3.4 Deliverable items

Digital Azimuth to Synchro Converter	(3.5)
Instruction Books	(3.11)
Trouble Shooting Manuals	(3.12)
Installation Material	(3.13)
Option Items	(3.5.1), (3.5.2.1), (3.5.3.1), (3.7.1), (3.9.1.1)

3.5 Performance requirements.- The equipment specified herein, shall accept 4096 pulses and one reference pulse for each 360 degree rotation of the antenna. The converter shall be capable of meeting specification requirements of all antenna speeds from 10 RPM (683 azimuth pulses per second) to 16 RPM (1092 azimuth pulses per second). The converter shall include a 12 bit counter for counting azimuth change pulses occuring in each antenna scan. The counter shall be preset by the azimuth reference pulse to a

predetermined count established to compensate for any misalignment of antenna equipment. It shall be possible, by switch selection, to adjust the preset count of the counter, in steps of one ACP, to any count within ± 2048 ACP from zero count in the counter as required for alignment. The converter shall provide, from the input data, two synchro outputs representing the one time (1X) and ten times (10X) antenna azimuthal positions. The converter outputs shall simulate three wire synchro transmitters with 60 cycle, 115 volt reference inputs.

3.5.1 Performance requirements option.- The equipment specified herein, shall accept 4096 pulses and one reference pulse for each 360 degree rotation of the antenna. The counter shall be capable of meeting specification requirements at all antenna speeds from 5 RPM (341 azimuth pulses per second) to 16 RPM (1092 azimuth pulses per second). The converter shall include a 12 bit counter for counting azimuth change pulses occuring in each antenna scan. The counter shall be preset by the azimuth reference pulse to a predetermined count established to compensate for any misalignment of antenna equipment. It shall be possible, by switch selection, to adjust the preset count of the counter, in steps of one ACP, to any count within ± 2048 ACP from zero count in the counter as required for alignment. The converter shall provide, from the input data, capability for two sets of two synchro outputs representing the one time (1X) and ten times (10X) and the 16 times (16X) and 36 times (36X) antenna azimuthal positions. The converter outputs shall simulate three wire synchro transmitters with 60 cycle, 115 volt reference inputs.

3.5.2 Input.- The converter shall be capable of operation with azimuth change pulse and azimuth reference pulse inputs provided over separate cables. With the equipment operating or turned off, all signal input impedances shall not be less than 5,000 ohms. Two BNC connectors shall be provided for each pulse input so that each input cable may be either terminated into a 75 ohm resistive load or extended to another Digital Azimuth to Synchro Converter. The characteristics of the input pulses are as follows:

Azimuth Change Pulses (ACP)	4096 pulses per 360° of antenna rotation equally spaced over 360°*
ACP pulse-to-pulse jitter	± 10% of nominal spacing
Azimuth Reference Pulse (ARP) (on separate line from ACP)	One pulse from every 360° of antenna rotation
ARP position	One each antenna rotation position, midway between two ACP's
ARP jitter	± 20% of ACP spacing

Azimuth pulse characteristics (ACP and ARP)	
Impedance (design center)	75 ohm
Logic level "0"	0 to 0.5 volts DC
Logic level "1"	5.0 ± 1.0 volts DC (positive going)
Pulse width	23 ± 3.0 microseconds
Pulse rise time	1.0 microsecond maximum
Pulse decay time	1.0 microsecond maximum

*Nominally, pulses fall at equal intervals; however, under certain conditions such as antenna wind loading pulse-to-pulse time variations can be expected. The reference pulse occurs midway between two of the equally spaced azimuth pulses.

3.5.2.1 Input option.- The converter shall be capable of operation with azimuth change pulse and azimuth reference pulse inputs provided over separate cables. With the equipment operating or turned off, all signal input imedpances shall not be less than 5,000 ohms. Two BNC connectors shall be provided for each pulse input so that each input cable may be either terminated into a 75 ohm resistive load or extended to another Digital Azimuth to Synchro Converter. In addition, there shall be two sets of 600 ohm balanced line inputs for each pulse input so that each balanced input may terminate in 600 ohms resistive load or be extended to another Digital Azimuth to Synchro Converter. The characteristics of the input pulses are as follows:

Azimuth Change Pulses (ACP)	4096 pulses per 360° of antenna rotation equally spaced over 360°*
ACP pulse-to-pulse jitter	± 10% of nominal spacing
Azimuth Reference Pulse (ARP) (on separate line from ACP)	One pulse from every 360° of antenna rotation
ARP position	One each antenna rotation position, midway between two ACP's
ARP jitter	± 20% of ACP spacing
Azimuth pulse characteristics (ACP and ARP)	
Impedance (design center)	75 ohm
Logic level "0"	0 to 0.5 volts DC
Logic level "1"	5.0 ± 1.0 volts DC (positive going)
Pulse width	23 ± 3.0 microsecond
Pulse rise time	1.0 microsecond maximum
Pulse decay time	1.0 microsecond maximum

*Nominally, pulses fall at equal intervals; however, under certain conditions such as antenna wind loading pulse-to-pulse time variations can be expected. The reference pulse occurs midway between two of the equally spaced azimuth pulses.

3.5.3 Output.- The converter shall provide an output, isolated from ground simulating the three-wire synchro transmitters of a two speed synchro system representing one time (1X) and ten times (10X) the antenna azimuthal position. Each output shall be capable of driving up to five (5 each) size 1 CT or 5 CT control transformers without phasing capacitors and shall be capable of driving up to fifteen (15 each) size 1 CT or 5 CT control transformers with phasing capacitors. The synchro output shall be related to azimuth count input so that both 1X and 10X outputs go through electrical zero when the counter goes through zero. For any fixed count (antenna stopped) the synchro outputs are present and accurately represent the correct azimuth angle.

The AC voltage used to provide the sunchro data reference voltage shall be fused separately from the primary power circuit used to develop DC power supply voltages. A separate "Reference" on-off switch shall be provided in addition to the "Power" on-off switch. In addition, each S1, S2, S3 output shall be fused so that a direct short-circuit across the output shall not damage the Digital Azimuth to Synchro Converter.

Characteristics of the converter synchro data shall be as follows:

Reference voltage	60 Hz, 120 volts
Output, line-to-line	60 Hz, 90 volts
Simulates	1X and 10X 3 wire TX
Accuracy	1X-5 minutes
	10X-30 seconds referred to 1X

3.5.3.1 Output option.- The converter shall provide an output, isolated from ground simulating the three-wire synchro transmitters of a four speed synchro system representing one time (1X) and ten times (10X), and sixteen times (16X) and thirty-six times (36X) the antenna azimuthal position. Each output shall be capable of driving up to five (5 each) size 1 CT or 5 CT control transformers without phasing capacitors and shall be capable of driving up to fifteen (15 each) size 1 CT or 5 CT control transformers with phasing capacitors. The synchro output shall be related to azimuth count input so that the 1X and 10X, and 16X and 36X outputs go through electrical zero when the counter goes through zero. For any fixed count (antenna stopped) the synchro outputs are present and accurately represent the correct azimuth angle.

The AC voltage used to provide the synchro data reference voltage shall be fused separately from the primary power circuit used to develop DC power supply voltages. A separate "Reference" on-off switch shall be provided in addition to the "Power" on-off switch. In addition, each S1, S2, S3 output shall be fused so that a direct short-circuit across the output shall not damage the Digital Azimuth to Synchro Converter.

Characteristics of the converter synchro data shall be as follows:

Reference voltage	60 Hz, 120 volts
Output, line-to-line	60 Hz, 90 volts
Simulates	1X, 10X, and 16X, 36X 3 wire TX
Accuracy	1X-5 minutes
	10X-30 seconds referred to 1X
	16X-18.8 seconds
	36X-8.33 seconds

3.5.4 Power supplies.- All power supplies shall be self-protecting such that without the use of fuses, circuit breakers or other protective devices, a continuous short across the power supply output will not damage circuit components and the output voltage will return to normal upon removal of the short circuit.

3.5.4.1 Regulation. All power supplies, except those specifically exempted, shall be electronically regulated to maintain output voltage to within ± 1% of the nominal value as the load is varied from 30% less than to 40% more than the normal load, and as the line voltage is varied between the service condition limits. The output voltage of regulated supplies shall be continuously variable over a minimum range of ± 10% of the nominal value, and the regulation and ripple specifications shall be met for any value of the output voltage within its adjustment range. Power supply output voltage shall not vary by more than ± 1% from the initial setting during operation over the service conditions. Each regulated power supply shall employ its own separate voltage reference device, and shall not rely upon another power supply for a voltage reference. If a low voltage control circuit power supply is employed, it is not required to be electronically regulated.

3.5.4.2 Ripple voltages.- Ripple voltages, defined as the peak-to-peak value of a simple or complex waveform consisting of power line frequency components and harmonics thereof, and synchronous or repetitive non-synchronous transients, shall not exceed 0.1 volt peak-to-peak for all electronically regulated power supplies. The ripple voltage of all power supplies shall be such that all specification requirements are fulfilled and further reduction of the ripple voltage would not result in any significant improvement in the stability of operation, circuit control adjustments, or equipment operation.

3.5.4.3 Protection circuitry.- Provisions shall be made to automatically remove the voltage from circuits which would be damaged by the loss or operating reduction of bias voltage when the bias voltage falls below a safe value. In addition, over-voltage protection circuitry shall be provided to automatically remove any excessive high voltage from circuits which would be damaged by an over-voltage condition.

3.5.4.4 Metering.- Meters and associated switches for use in measuring all power supply output voltages and currents shall be provided. They shall be located on the front panel. When a meter is utilized to measure

only one parameter, the meter shall read directly. Each meter shall be provided with a replaceable card insert mounted near the meter to designate the proper reading of each associated switch position. If a meter cannot be used for multiple functions without external shunts or multipliers, such shunts or multipliers shall conform to the requirements of paragraph 1-3.16.6.8 of Specification FAA-G-2100/1. Operation of meter selector switches shall not interfere with proper system performance, such as might be caused by meter insertion to read current, or transients caused by meter selector switching.

3.5.4.5 Power supply indicators.- Each circuit protected by a fuse or circuit breaker shall have an indicator lamp which shall be illuminated when the fuse (or circuit breaker) is open. Neon indicator lamps shall be used wherever this is practicable. All indicator lamps shall be uniformly located with respect to their associated fuses or circuit breakers, or they may be an integral part of the fuse holder assembly.

3.5.4.6 Line voltage regulators.- Line voltage regulators shall not be used as a means of meeting the system performance requirements under service conditions.

3.5.4.7 Primary power.- All requirements stated herein shall be met without readjustment when primary power supply voltages and frequencies vary, rapidly or slowly, between the limits specified in paragraph 3.3.1. There shall be no discernible variation in performance during primary power line voltage or frequency changes.

3.6 External connections.- All signal input, output, and primary power connections shall be made through quick-disconnect connectors or jacks located on the rear panel.

3.7 Reliability.- The contractor shall submit predicted MTBF and MTTR reliability calculations for the equipment to be delivered herein using the method contained in MIL-STD-756A and MIL-HDBK-217A. The converter shall exhibit a minimum MTBF of 10,000 hours and a maximum MTTR of 0.5 hours.

3.7.1 Reliability demonstration option.- A reliability demonstration shall be conducted in accordance with test Plan V, Test Level A-1 (MIL-STD-781B) on the equipments specified herein. The minimum number of test units to be used for the reliability demonstration shall be as specified in the contract.

3.7.2 Maintainability.- A formal demonstration of maintainability is not required; however, this does not relieve the contractor from designing the equipment to meet the specified MTTR, MTBPM, and MPMT. The requirements of MIL-STD-470 shall be used as guide lines in attaining this end.

3.8 Radio frequency interference.- The equipment shall meet the requirements of MIL-STD-461 Class IC from 30 Hz to 300 MHz.

3.9 Construction

3.9.1 Rack mounting.- The Digital Azimuth to Synchro Converter shall be designed to be rack mounted so that the complete assembly, connected for normal operation, can be installed in a Type I cabinet rack as described and illustrated in FAA-E-163. The height shall be a maximum of 12 1/4 inches. Equipment shall be fabricated from aluminum material. The structual strength and rigidity of the equipment shall be such that normal handling in loading, shipping, unloading, and setting into position for installation will not result in any permanent set or deformation sufficient to impair the appearance of the cabinets or interfere with operation, ease of maintenance, removal of units and components, and ventilation. The design shall provide maximum accessibility for maintenance and repair of units, components, and circuits, as well as neat and pleasing appearance. The equipment shall be of high quality, sturdy construction, accurately and carefully fabricated. The panel shall be adequately braced and a maximum weight of 50 pounds to permit removal and replacement of units by one technician for maintenance or repair of units on bench or for interchanging of units without any danger of permanent sets or deformation due to the normal handling of the unit.

3.9.1.1 Type I mounting rack option.- The contractor shall furnish Type I mounting racks for equipment installation in accordance with the requirements in Specification FAA-E-163.

3.9.2 Wire and cable protection.- All individual wires and cables subject to chafing or abrasion shall be suitably protected; this protection shall be independent of the individual wire or cable insulation or jacket. This requirement is in addition to the requirements of 1-3.10.7, FAA-G-2100/1, and does not relieve the contractor from compliance with 1-3.10.7, FAA-G-2100/1.

3.9.3 Ventilation and cooling.- The equipment shall be designed to be cooled when in operation and when rack mounted as specified above in paragraph 3.9.1. Forced air cooling shall not be utilized without specific Government approval.

3.9.4 Not used

3.9.5 Packaging.- The basic packaging concept of the equipment shall be modular plug-in cards or small plug-in assemblies to the greatest extent consistent with good engineering practices. This does not relieve any other requirements, e.g., RFI integrite, operation under environmental conditions, reliability, equipment performance, equipment capability, functional capability, etc. It is realized that portions of the equipment may not be amendable to this type of modular construction.

3.9.5.1 Printed-circuit board supports.- All boards shall be supported within one inch of the edge on at least two edges not including the edge with the connector. Support shall be provided to prevent fracture or loosening of the foil due to flexing the board.

3.9.5.2 Printed-circuit board connectors.- The printed-circuit board connector receptacles shall contain a polarizing key and the key location or form shall be different for each different type of printed-circuit board. All boards of the same type shall have the same polarizing key location or form to insure insertion of the proper type board. Mating connectors shall be designed for repeated use with the module to ensure long term reliable performance, and with suitable mountings to permit positive connection-meshing without jamming or otherwise damaging the connector elements.

3.9.5.3 Printed-circuit board removal.- All printed-circuit boards shall include a convenient means for aiding maintenance personnel in grasping the board for removal from its mounting. This may consist of a special handle, cutout reinforced for finger holds or similar means. A special removal tool shall not be required. The method used by the contractor shall permit easy removal of the board without damage or undue strain of the board or any component mounted thereon.

3.9.5.4 Reserve card capacity.- Reserve circuit card capacity shall be provided to accommodate 20% more cards (minimum of two) in each bin than the equipment requires.

3.9.5.5 Printed-circuit board extender.- With each equipment, there shall be supplied a printed-circuit board "extender." An extender consists of a printed-circuit board (not keyed in order to permit insertion into any connector) provided with printed circuitry to extend all plug input points across the board to a receptacle on the opposite end, into which receptacle a removed printed-circuit board can be plugged. The extender board thus provides an accessible active operating position for any printed-circuit board normally inaccessible for ready maintenance and test while within the card cage. The extender shall be furnished installed in a spare blank printed-circuit board receptacle position provided for that purpose.

3.9.6 Test points.- Test points shall be provided for measurement and observation of all voltages and waveforms needed for checking performance and for maintenance of individual units. Except where the functioning of circuits would be adversely affected by long leads, test points shall be accessible on the front panel. Test points necessary for frequent alignment and adjustment purposes shall be provided on plug-in cards and modules and shall be accessible without a card extender. Test points for waveforms shall be provided with jacks suitable for use with oscilloscope test leads. Tip jacks shall be provided for the measurement of voltages. All test points shall be identified with a TP number; and a voltage value, signal waveform, or descriptive title (if voltage value or waveform would not be particularly significant) shall be indicated adjacent thereto, as well as on each schematic diagram. Only descriptive titles or voltage values shall be shown for test points on the front panel. The equipment shall be designed to provide for connections for such test equipment as may be required for its expeditious maintenance, calibration and repair. All test points shall be readily accessible with adequate clearance and visibility when plug-in extension units are in position. Connection of normally used test equipment to any test point shall in no way affect system performance.

3.9.7 Parts requirements

3.9.7.1 Integrated circuits, transistor and other semiconductor devices.- Equipment design shall be such as to utilize solid state devices throughout the equipment electronic circuitry. The number of different types of integrated circuits, transistors and semiconductor diodes shall be kept to an absolute minimum consistent with good design and engineering practice as well as complying with specification performance requirements under both the test and service conditions.

3.9.8 Controls.- All circuits shall be so designed that no damage will occur when the equipment is operated with the maintenance adjustments set to any possible configuration of settings. No fuses shall blow with actuation of any controls. There shall be no noticeable lag between the actuation or adjustment of controls and the effect of the actuation or adjustment. All controls shall have calibration marking to permit setting to predetermined positions, except where it can be demonstrated to the satisfaction of the Government that such compliance is impracticable or unnecessary. Where the special nature of a function makes a large knob or screwdriver slot desirable, the use of such controls shall be subject to specific Government approval.

3.9.9 Grounding.- The grounding design must be compatible with other equipment with which this equipment may interface. The grounding design shall contain three discrete ground busses:

a. One that connects to the equipment chassis.

b. One that connects all signal return wires together.

c. One that connects all power grounds together.

The cabinet/frames (a) and the signal return (b) ground busses shall be isolated from the power ground (c) and also isolated from building (earth) ground except that both busses (a) and (b) are to be connected to the building ground at one common connection point. Signal return paths for signals shall use the shield of the coaxial cable, or a separate signal return wire shall be provided for each path if coaxial cable is not required. The power grounding system (c) shall be separate from the other two busses. All internal equipment ground wires shall be at least 500 circular mills per linear foot.

3.10 Special tools for maintenance.- All special tools necessary for repair, adjustment, or maintenance, not readily available on the open market, such as tuning wrenches, spanner wrenches, etc., shall be supplies with each equipment.

3.11 Instruction books.- Instruction books shall be in accordance with FAA-D-638, and shall be furnished in the quantity specified in the contract schedule.

3.12 Troubleshooting manuals.- Troubleshooting manuals shall be supplied in accordance with the requirements of the following subparagraphs. The quantity and disposition of the manuals shall be as specified in the contract schedule.

3.12.1 Purpose and scope of manual.- This book shall contain all diagrams and illustrations necessary for the isolation and repair of troubles within the display system. It shall be designed for convenient use by maintenance technicians and shall not contain detailed descriptive information. It shall contain copies of the schematic diagrams and system cabling diagrams which are incorporated in the instruction book. In addition, it shall contain simplified, enlarged diagrams of functions designed to aid in the rapid isolation and correction of troubles within the system. Such simplified diagrams shall show separately, in skeleton form, the complete circuitry of such functions as video trigger, etc., showing all test points in each circuit with the proper waveform for each test point. Separate wiring diagrams, in skeleton form, shall show and identify each plug, pin, terminal strip, meter, test point, switch, relay, etc., for the following circuits: AC power distribution, DC voltage supply distribution, metering, control functions and other circuits decided upon by mutual agreement between the Government and the contractor. All diagrams shall be arranged to permit simple, straight forward tracing with functions and directions of travel clearly indicated.

3.12.2 Construction and binding.- The troubleshooting manual shall be designed so that the book can be opened to any desired page and folded back upon itself so as to lay flat for easy reference during maintenance use. A multi-ring binding shall be utilized and shall be subject to the approval of the Government. Covers shall be stiff and durable and shall be made of cloth-covered cardboard or of laminated plastic to permit the book to be folded in a vertical position so as to be self-supporting with the selected page(s) nearly vertical. All diagrams shall be flat and not folded (except the system cabling diagrams). All diagrams shall be extra heavy and serviceable. The scale of schematic and system cabling diagrams shall be at least as great as that used in the instruction books. Diagrams shall be printed on only one side of the sheets.

3.12.3 Review and acceptance.- The procedures for instruction book review and acceptance specified in FAA-D-638 shall apply to the troubleshooting manuals.

3.13 Installation material.- All required installation material including, but not limited to, coaxial, control, and power cables, lugs, terminal blocks, BNC connectors, and terminators shall be supplied by the contractor.

3.14 Modification to FAA-D-638.- This specification applies in its entirety except as modified in the subparagraph hereunder.

3.14.1 Paragraph 3.39.6 Test equipment list.- Add the following at the end of the paragraph: "At least 120 days prior to the scheduled delivery of the first equipment, three (3) copies of the test equipment list shall be submitted to the FAA Contracting Officer."

4. QUALITY ASSURANCE PROVISIONS

4.1 General.- Quality Assurance Provisions shall be in accordance with the applicable requirements of FAA-G-2100/1.

4.2 Type test.- The following shall apply in addition to the requirement of 1-4.3.3 of FAA-G-2100/1. Equipment or equipments scheduled for shipment subsequent to the equipment being type tested shall not be shipped from the contractor's plant without Government approval or until all the type tests have been completed on the pertinent equipment and the type test results have been accepted as satisfactory by the Government.

5. PREPARATION FOR DELIVERY

5.1 General.- Preparation for delivery shall be in accordance with MIL-E-17555.

6. NOTES

6.1 Note on information items. The contents of this Section 6 are only for the information of the initiator of the procurement request and are not a part of the requirements of this specification. They are not contract requirements nor binding on either the Government or the contractor. In order for these terms to become a part of the resulting contract, they must be specifically incorporated in the schedule of the contract. Any reliance placed by the contractor on the information in these subparagraphs is wholly at the contractor's own risk.

6.1.1 Cable requirements.- The cable length requirements will be stated elsewhere in the contract (3.13).

6.1.2 Options

6.1.2.1 Type I racks option.- The contract will state specifically the number of Type I racks which are to be furnished (3.9.1.1).

6.1.2.2 Sixteen times (16X) and thirty-six times (36X) option.- The contract will state specifically whether the sixteen (16X) and thirty-six (36X) converters are to be furnished (3.5.1), (3.5.2.1), (3.5.3.1).

6.1.2.3 Reliability demonstration option.- The contract will state specifically whether the Reliability Demonstration (3.7.1) is to be conducted.

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